(11.)

EXCISION OF THE KNEE-JOINT

TOGETHER WITH A REPORT OF THREE HUNDRED AND TWENTY-NINE CASES TREATED ACCORDING TO MODERN ANTISEPTIC METHODS, AND FOUR CASES OF RESECTION OF THE HAMSTRING TENDON TO PREVENT RELAPSE IN CHILDREN

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BY

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EXCISION OF THE KNEE-JOINT.

TOGETHER WITH A REPORT OF THREE HUNDRED AND TWENTY-NINE CASES TREATED ACCORDING TO MODERN ANTISEPTIC METHODS, AND FOUR CASES OF RESECTION OF THE HAMSTRING TENDON TO PREVENT RELAPSE IN CHILDREN.

IN 1879 I performed a complete excision, in a case nine years of age, for destructive chronic disease of the knee-joint. The case came into my hands after the limb had become somewhat flexed, and sinuses had formed upon the outer and inner sides of the knee. I proceeded to open the joint for the purpose of exploration and establishing drainage, but found extensive disease. The entire articular surfaces of the bones were in a necrotic condition. I at once extended my incision from the inner condyle to the outer, and below the patella, describing a curve, and freely opened the joint. After sawing away the articular surface of each bone in such a manner as to allow them to come together in a slightly flexed position, and removing the patella, together with all diseased tissue in and about the joint, and excising the old sinuses, I wired the bones together and dressed the leg with plaster-of-Paris applied over the dressing, and slung it up in order to keep the part at perfect rest. Before the plaster-of-Paris became hard a large opening was cut, through which the subsequent dressings were made.

The case progressed favorably and recovered, being discharged at the end of four months. Eight months subsequently the patient returned, and I found that the leg was flexed at an angle of forty-five degrees. The patient suffered some pain at the point of excision during locomotion. Upon an attempt to straighten the leg pain was produced, and also severe reflex spasm of the hamstring tendons. I at once etherized the patient, *resected the hamstring tendons* through small open wounds, and attempted to straighten the limb, but failed. I then made an incision directly across the front of the joint and sawed out a wedge-shaped piece of bone, sufficiently large to admit of straightening the limb ; the leg was placed in a *perfectly straight position*, the bones wired and dressed as before. There was some shock, and fever following, which subsided after a few days. From this time the case went on to recovery, and at the end of three months was discharged, well, with one inch of shortening. A posterior splint was worn for six months. I have learned by letter that the case has never relapsed. The relapse, Mr. President, occurring in this case—which to me at that time was somewhat novel—and my observations since of several cases of this kind in the hospitals of Europe—and which, I learned from European surgeons, is by no means uncommon—induced me to accept your kind invitation to present here, at this meeting, a paper on excision of the knee-joint. Why did the case relapse ? A glance at the drawing (Fig 1) will, I think, furnish a solution of the question.

The second case, in a boy aged ten years, was one of chronic suppurative inflammation of the knee-joint. One year before he received a blow upon the knee which produced a subacute inflammation, which gradually destroyed the joint. The leg was flexed at an angle of forty-five degrees, and the capsule was distended with fluid. An exploratory incision was made just above the inner condyle. Upon introducing the finger the ends of the bones were found denuded of cartilage and the joint filled with a gelatinous material. After a thorough washing, so as to expose the parts, I found the bone so extensively diseased that an excision of the entire joint seemed to promise the best result. The incision, as already described, was made. With a saw the articular surfaces were removed in such a manner as to allow the bones to be approximated in a straight line. After the removal of all diseased tissue the hamstring tendons to the extent of an inch and a half were resected through small open wounds. The bones were wired and the limb dressed the same way as in the previous case. A small amount of suppuration occurred in the soft parts. The recovery was perfect, and after three months the patient was discharged with bony union. The limb has never relapsed, and is as useful as a stiff limb can be with three-fourths of an inch shortening.

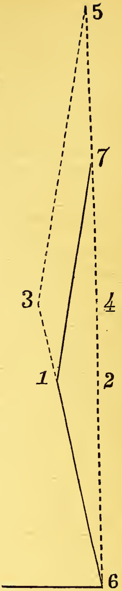

FIG. 1.—The limb being placed in a slightly flexed position, 6, 1, 7 makes an angle at 1, 2. The weight of the body acting upon this point when the limb is flexed, may produce flexion by gradual and constant pressure at 1, which irritation causes reflex contraction of the hamstring tendons. Therefore the weight of the body and the reflex contraction of the hamstrings causes the relapse. The relapse occurring later is caused by the growth of the limb, 6, 3, 5, making the angle greater at 3, 4. The weight being increased, the angle greater, and the bones longer, exercises a greater strain at 3.

CASE III.—Aged sixteen years, chronic disease, subluxation, and necrosis of the head of the femur; possesses no special point of interest. The steps, as already given, with the exception of dressing, were taken; the case recovered and was discharged at the end of three months with a good limb; no pus or fever occurring after the operation.

Case IV.—Aged twenty years, chronic inflammation from injury ten years previous. The leg was flexed and the joint filled with a cheesy substance. Crepitation could be distinctly felt and heard. An exploratory examination by incision revealed the fact that extensive disease of the bones was present. Amputation or excision was to be decided upon. An incision beginning at the inner condyle, and carried directly over the centre of the patella, which was sawn through, after Volkmann, to the external condyle, exposed the joint most perfectly. Not only was there extensive bone disease, as seen in those specimens which were removed, but the entire capsule was thickened and infiltrated. With curved scissors and forceps all diseased tissues, including the capsule of the joint, were removed. The joint-surface of the patella was also scraped off. The bones and the patella were now wired, which nicely coaptated them, and the wound closed. Large drainage-tubes were inserted. Permanent dressings were applied, consisting of sublimated gauze and wood-wool bags, extending from the foot to the body, and over all the plaster-of-Paris bandage. The leg was slung up. At the first dressing, seven days later, the wound had entirely healed, except at the point of drainage. The drainage-tubes were removed and the leg again dressed as before. Three weeks later, at the second dressing, the wound was found perfectly healed. At the end of two months the patient was out on crutches. Four months from the time of the operation he walked on the leg. In this case there was no rise of temperature above 100° F.; pulse never above 90; no pus or pain, and the wound united by primary union as in the preceding case.

Case V.—Aged thirteen years; male; suffering from chronic inflammation of the knee-joint for six years. Leg flexed at an angle of forty-five degrees. The joint was found filled with fungus and there was extensive disease of the bones. I proceeded to perform an operation according to Neuber, of Kiel, Germany, and which, I believe, has not heretofore been resorted to in this country (see Figs. 2 and 3). An incision, extending from the outer condyle, underneath the patella to the inner condyle, brought the joint into view. The heads of the femur and tibia were sawed square, parallel with the joint surfaces. The posterior projecting portions of the condyles were also removed. The patella was now joined at its under surfaces and securely nailed to the front of the tibia and femur with strong steel nails. A wire was also inserted

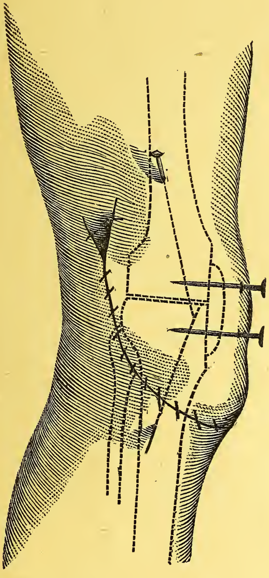

FIG. 2.

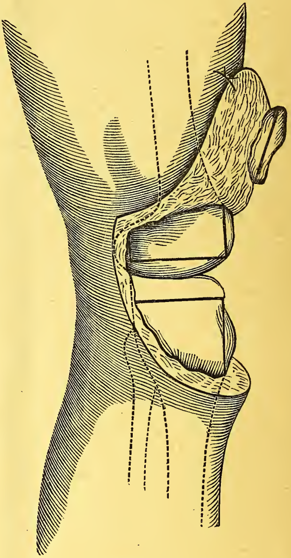

FIG. 3.

on each side, from tibia to femur, to more securely hold the bones. The case was dressed the same as the preceding. I neglected to say that the hamstrings were resected, and all disease removed from in and about the joint. The case developed no fever or pus, and but little pain, and healed perfectly under the dressings in three weeks. Patient walks well with a perfectly straight leg.

Cases VI. and VII.—Male, twenty-one years of age; female, twenty years of age; both chronic inflammation of the knee-joint, of several years' standing, with extensive bone disease, were resected before the class in Mary Fletcher Hospital, University of Vermont. Fenwick operation was performed. The cutting of the bones constitutes the distinguishing feature (see Fig. 3). The cases were dressed similarly to the preceding case, and healed perfectly under two dressings, in three weeks, without pus or fever above 101°, and with no considerable degree of pain. Discharged from the hospital in seven weeks, cured.

Case VIII.—Female, aged nineteen, extensive fungous disease of joint, with osteitis of the head of femur. The joint was opened for exploration and washing out, but the disease was found to be so extensive that immediate excision or amputation was decided upon. Excision was performed before the class in the amphitheatre of the above-named hospital. The excessive administration of ether caused death, which took place soon after the completion of the operation. The operation of Dr. Fenwick was performed. The microscope revealed the presence of pus in the cancellated structure of the bone.

The favorable course in Cases III., IV., V., VI., and VII., was due to the perfect coaptation of the bony and soft parts, good drainage, and antiseptic dressings which did not require constant change; thus allowing the parts to remain at perfect rest, and at the same time, by the method of their application, exercising equal pressure, which regulated the circulation, preventing swelling, and obliterated cavities or pockets which might have existed when

TABLE I.

Reference.		Operator.	Patient.	Excision.	Result.	Disease.	Remarks.
Birming. Med. Review, 1879, viii., 201.	1	West, I. F.	Female. 26.	Retention of gouged patella.	Patient walks six miles.	Caries of articular bones.	
Australian Med. Jour., 1885, vii., 252.	2	Webb.	Female, 24.	Complete.	Amputation on account of abscess cavity in tibia.	Purulent synovitis; ascites.	Bone wired.
Med. News, 1884, xlv., 493.	3	Stimson.	Male, 45.	Complete.	Good; patient walks with little limp.	Suppurative arthritis for seven years.	Wire suture and splint.
St. Louis Courier of Med., 1882, viii., 532.	4	Causon.	Male, 27.	Complete.	Bony union seven weeks later.	Rheumatic arthritis; deformity.	
Australian Med. Jour., 1879, n. s., 579.	5	Fitzgerald.	Female, 46.	Complete.	Useful leg; subsequent relapse; amputation.	Chronic arthritis five years.	
British Med. Jour., 1884, i., 268.	6	Percival.	Male, 40.	Of cartilages.	Three months after walks well without crutch.	Chronic arthritis five years; anchylosis.	Posterior splint.
British Med. Jour., 1879, ii., 317.	7	Morgan.	Female, 12.	Complete.	One year later, firm union; walks with ease. Sixteen months after, flexion to right angle.	Chronic arthritis.	
British Med. Jour., 1883, ii., 860.	8	Campbell.	Female, 35.	Complete.	Cured sixty-seven days after operation.	Acute ulceration of cartilages.	
New York Med. Jour., 1880, xvii., 156.	9	Briddon.	Male, 5.	Volkmann's.	Primary union; patella movable one-half inch.	Tubercular arthritis.	Catgut for bone.
St. Louis Med. Jour., 1883, xiv., 304.	10	Laidley.	Male, 26.	Complete.	Useful limb.	Necrosis, anchylosis, and deformity; traumatic.	Tenotomy of hamstring, post splint.
St. Louis Med. Jour., 1885, xlix., 79.	11	Lister.	Male, 11.	Complete.	....	Strumous arthritis five years.	Tenotomy of hamstring, silver wire for bone.
Med. Times and Gazette, 1884, ii., 321.	12	Parker.	Male, 6½.	Complete.	No union; want of reparation; amputation.	Chronic arthritis.	
Bull. et Mem. Soc. de Chir. de Paris, 1881, vii., 571.	13	Boeckel.	Male, 2.	Complete.	Useful limb.	White swelling; fistula; deformity, right angle.	
Bull. et Mem. Soc. de Chir. de Paris, 1882, viii., 319.	14	Cazin.	Female, 6½.	Complete.	Primary union, no bony union; new articulation nearly as good as new; no patella.	Osteoarthritis,	Gutta-percha apparatus.
Bull. et Mem. Soc. de Chir. de Paris, 1881, vii., 57.	15	Boeckel.	Female, 7.	Excision, subsequent amputation.	Death from tubercular meningitis.	White swelling, four years' standing.	
Lancet, 1884, i., 889.	16	Boutflower.	Male, 7.	Complete.	Wound healed in fourteen days. In ten weeks leg was	Chronic arthritis; anchylosis.	Watson splint.

					short; walks well without pain.		
Lancet, 1880, ii., 379.	18	Barber.	Female, 20.	Complete.	Wound healed, and fibrous union eight weeks after.	Chronic arthritis.	Back splint.
Lancet, 1879, i., 517.	19	Moore.	Female, 14.	Complete.	Good; one year after, straight and stiff.	Chronic arthritis.	
New York Med. Jour., 1879, xxix., 70.	20	Mason.	Male, 36.	Complete.	Walks with crutches; seven months later, still some caries.	Caries in condyles.	Plaster-of-Paris splint.
New York Med. Jour., 1885, xlii., 161.	21	Ripley.	Male, 28.	Complete.	Good recovery; two inch shortening.	Chronic arthritis for three years.	Wire for bones.
Chicago Med. Jour., 1883, xlvi., 471.	22	Bogue.	Female, 16.	Complete.	Four years after, good useful limb, four inches short.	Chronic arthritis.	Anterior splint and suspension.
Med. Press and Circular, 1880, i., 85.	23	O'Grady.	Male, 18.	Removal of patella and part of shaft of femur.	Amputation seventy-five days later.	Chronic arthritis	Box splint.
Dublin Monthly Jour., 1884, lxxviii., 172.	24	Bennett.	Female, 10.	Complete.	Freely movable joint to right angle; good health at seven months.	Chronic arthritis; partial anchylosis.	Plaster-of-Paris splint.
Kansas City Med. Jour., 1884, v., 48.	25	Von Quast.	Male.	Complete.	Six months later could walk well; one and three-fourths inch shortening.	Bullet-wound of femur and tibia.	Plaster-of-Paris splint and suspension.
Am. Jour. Med. Sciences, October, 1884.	26	Fuller.	Male, 16.	Complete.	Healed by primary union; one dressing.	Tubercular arthritis; three years' deformity.	Steel nails for bone ends.
Pittsburg Med. Jour., 1882, ii., 167.	27	Wallace.	Male, 33.	Complete.	Slightly movable joint, walks with trifling limp.	Suppurative arthritis; deformity; anchylosis.	Posterior splint.
Med. and Surg. Reporter, 1878, xxxix., 312.	28	Schenck.	Male, 35.	Complete.	Doing well a week later.	Tubercular arthritis.	Long cradle splint.
Glasgow Med. Jour., 1880, xiv., 423.	29	Benton.	Female, 9.	Complete.	Primary union; walks well three months later.	Ulceration of cartilages.	
Australian Med. Jour., 1884, iv., 163.	30	Drew.	Male.	Complete.	No suppuration.	Chronic arthritis.	Hays' splint.
Arch. Med. Belges, 1881, xix., 116.	31	Leroy.	Male, 14.	Complete.	Firm union; walks well with high shoe.	Tumor albus; deformity.	
Indian Med. Jour., 1880, xv., 185.	32	Mahendra Nathahdedar.	Male, 14.	Complete, patella not removed.	Perfect bony union; treatment one hundred and eighty days.	Suppurative arthritis.	McIntyre splint.
					Recovery.	Anchylosis from unknown cause.	Tenotomy of hamstrings.
Indian Med. Jour., 1881, xvi., 309.	33	Shah.	Male, 10.	Complete, patella not removed.			
....	34	Weir.	Female, 19.	Complete.	Subsequent amputation.	Tubercular arthritis.	
D. Zeit. für Chir., 1882, xvii., 564.	35	Preetorius.	Female, 9.	Volkmann's.	Died from shock.	Fungous arthritis.	
New York Medical Record.	36	Morris, R. T.	Male, 13.	Complete.	Healed under one dressing; walks well.	Traumatic arthritis; anchylosis.	Tenotomy of hamstrings.

the soft parts were brought together. In addition to all this the carrying out from the beginning to the completion of the operation, and at the subsequent dressings, the most scrupulous details of modern antiseptic methods.

Want of time compels me to thus briefly report these eight cases, with nine operations.

The end sought in all operations of excision of the knee-joint should be:

1st. To remove all diseased tissue, including the capsule of the joint.

2d. To make the incisions in such a manner as to furnish easy access to every part of the joint and furnish perfect drainage.

3d. To restore all tissues to their normal position without leaving cavities.

4th. To get perfect drainage.

5th. To insure absolute immobility of parts after the operation.

6th. In children, after *resection of the flexor tendons, placing the limb straight and utilizing the patella when practicable, to prevent relapse.*

The operations which are preferable and meet these indications best are Volkmann's, Fenwick's, and Neuber's.

If these requirements are carefully followed out, and if all diseased tissue is removed, including the capsule of the joint, the surgeon will have to deal simply with compound fracture, and the mortality from the operation ought not to be greater than from accidental compound fracture of the femur which has been carefully wired and dressed according to the light which surgery of the nineteenth century sheds. The peculiar advantage of sawing the bones after Fenwick's method keeps them in position, even if a slight subsequent flexion occurs, as the head of the femur fits the socket-head of the tibia similarly to a hinged joint. Should flexions occur in cases where the bone is cut squarely across, a cavity would be left on the anterior side, making a pocket for the accumulation of secretions between the ends of the bones, which would be quite likely to prevent bony union or defeat the object of the operation by long-continued suppuration. The extreme difficulty, however, of cutting the bones to fit perfectly, without leaving cavities between their surfaces, after Fenwick's method, is quite apparent, as curves are more difficult to make than angles.

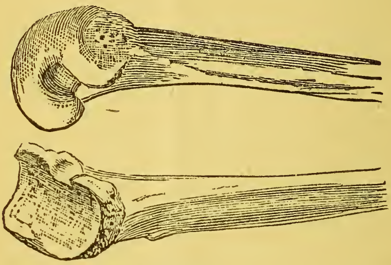

FIG. 4.

In Volkmann's and Neuber's methods the patella plays the important part of holding the bones in perfect coaptation; in Neuber's, it forms a splice of the bones; while in Volkmann's, by the action of the quadriceps muscle and its immediate union to the surface of the femur and tibia which has been prepared for it, the patella performs the same function. In children the patella, if not extensively diseased, should be thus utilized. This, in connection with placing the limb in a perfectly straight position, and the resection of the hamstring tendons, will, I believe, prevent the disastrous relapses so frequently occurring in subjects under fourteen years of age. A posterior splint should also be worn for one year or more.

Tenotomy of the hamstring tendons has been frequently performed to allow the straightening of the limb before the operation, otherwise a greater amount of bone would be sacrificed. But as to resection of all the flexor tendons to prevent their subsequent action in producing relapse in children, I am not aware of its ever having been done prior to the four cases which I here report. After an excision, the leg, so far as the knee-joint is concerned, becomes a crutch, and, were all muscles and tendons which act upon it removed, the power of locomotion would not be affected. Therefore a resection of one or two inches of the hamstring tendons, through two small incisions, when done antiseptically, adds nothing to the danger of the operation.

The mortality from excision of the knee-joint, as compiled by Culbertson, from all sources in private practice is: Under five years of age, 38.9 per cent.; between five and ten years, 16.2 per cent.; between ten and fifteen years, 17.2 per cent.; between fifteen and twenty years, 30.1 per cent.; between twenty and twenty-five years, 39.4 per cent.; between twenty-five and thirty years, 37 per cent.; between thirty and forty years, 41.5 per cent.; over forty years, 52.6 per cent.; an average in all cases of 29.8 per cent. These figures show the most favorable age to be between five and ten. But there is more danger of relapse, non-bony union, and permanent shortening from cutting into the epiphyseal line at that age. Puberty is the most favorable age. From the same compilation the mortality from gunshot wounds is 75 per cent.; other injuries, 39 per cent.; disease, 31 per cent.; deformity, 13 per cent. The mortality from military amputations is: In the lower third of thigh, 50 per cent.; hospital amputations, 35 to 57 per cent.; amputations for disease, 22 per cent. Edwards' plates of military excisions show a mortality without excision of 80 per cent.; with excision, 80 per cent.; amputation, 73 per cent., being 7 per cent. in favor of amputation in gunshot wounds.

These statistics are made up from foreign wars and our late rebellion. If the above statistics are correct, and modern methods of operating and dressing were followed, clearly excision of the knee-joint should be abandoned in military surgery and also in gunshot wounds in which the bones of the joint are extensively comminuted. But these compilations were made in 1877, from cases many of which were operated upon prior to the advent of the more scientific antiseptic methods of to-day.

In Culbertson's tables (see "Prize Essay," 1876), 684 cases of excision of the knee-joint for disease, injury, and deformity are reported. I find 51 deaths from pyæmia, and septicæmia, 31 from exhaustion, 6 from erysipelas, 3 from hectica, 2 from phlebitis, 4 from secondary hemorrhage, and 1 from acute suppuration, a large majority of which are due to wound infections—a death-rate from all causes of 14.47 per cent.; from pyæmia and septicæmia alone of 7.45 per cent.

A glance at the tables appended, which have been carefully compiled from sources known to be rigidly antiseptic, and all since 1878, will furnish a key to the large per cent. of mortality prior to that date. In 329 operations are found 31 deaths—a mortality of 9.42 per cent. Excluding 21 cases of deaths from phthisis and other diseases not dependent upon the operation, gives a mortality of only 3.03 per cent. In 329 cases there are only 3 cases of septicæmia and 1 of pyæmia. Add to 9.42 per cent. the 14.47 per cent. death-rate from Culbertson's tables from wound-infection gives 23.89 per cent., which is nearly the exact rate furnished in his tables as the mortality following excision of the knee-joint. The reduction of mortality from 29.8 per cent. to 9.42 per cent. is sufficient evidence, I think, to convince the profession of the efficacy of modern antiseptic methods, and this has been mainly due to the prevention of wound infection, as I have already shown. Deducting the 21 cases of death not due to the operation reduces the mortality to 3.03 per cent. (see Table II.). The same 684 cases show, by Culbertson's tables, 77 amputations, or 11.25 per cent.; in the 329 cases reported in this paper 19, or 5.77 per cent.

I will state that the class of diseases, and the causes for which excision has been performed, vary but little in Culbertson's compilation and those of this paper. In his 684 cases are to be found less than a dozen cases of excision for recent injury. Another noticeable fact is, that in the table of Culbertson of "Excision for Deformities" there are 53 cases with no amputations, but 7 deaths—5 from sepsis, 1 from pleuro-pneumonia, and 1 from tetanus. The amputations are reserved for the operations performed upon already diseased or suppurating joints, but the mortality being about thirteen per cent. is still very much larger than the present mortality furnished from operations upon already diseased or suppurating joints, and, as stated by Culbertson, the per cent. is in one class of cases 29.8, the other 13. Wound-infection then was quite common, and difficult to do away with, when suppurative processes were already found in joints; now they are easily managed.

Cases for excision of the knee-joint should be carefully selected. In children under eight years of age it should never be resorted to, except in cases of destruction of the entire joint, and not until after other means have failed. It is better at this age to excise through exploratory openings such portions of bone and tissue as are found diseased, using the gouge-scoop and chisel thoroughly, establishing perfect drainage, fixation, and extension. Chronic diseases with deformity, either purulent or non-purulent, not yielding to the ordinary methods of treatment, are suitable cases at any age. Extensive suppuration, burrowing of pus, with many sinuses distributed about the joint, and extensive necrosis, making it difficult, uncertain, or impossible to remove all diseased tissue, are cases more suitable for amputation. Deformities from long-standing arthritis, with but little bone disease, limited to the articulations, are very favorable cases for excision. Anchylosis in bad position, compound luxation, and subluxations from long-standing joint diseases should be excised.

Table II.—*Showing Mortality of Cases of each Operator.*

Reference.	Operator.	Number.	Deaths.	Recoveries.	Subsequent amputation.*	Per cent. mortality.
International Ency. of Surgery, vol. iv., 5, 18.	Ashhurst, Jr.	26	2	24	..	..
International Ency. of Surgery, vol. iv., 5, 42.	Fenwick.	28	1	27	2	..
Transactions Eighth Int. Congress, surgical vol.	Schede.	30	4	26	..	..
New York Medical Record.	Phelps, A. M.	8	1	7	..	.
D. Zeit. für Chir., 1880, xiii., 309.	Wahr.	3	..	3	..	..
D. Zeit. für Chir., 1880, xiii., 309.	Rydygier.	6	1	5	1	..
Charité Annalen, 1883, 368.	Bardeleben.	4	..	4	..	..
Bull. et Mem. Soc. de Chir. d. Paris, 1879, 461.	Poinsot.	6	..	6	..	..
Trans. Ind. Med. Soc., 1879, xxix., 108.	Eastman.	3	..	3	..	..
Hospitals-Tidende, 1884, 3 R., 241.	Hansen.	4	..	4	..	..
Hospitals-Tidende, 1879, 2 R., 441.	Saxtorph.	31	7	23	..	..
Lancet, 1883, i., 101.	Golding Bird.	2	..	2	..	..
Rev. de Chir., 1883, iii., 352 and 394.	Ollier.	2	..	2	..	..
Deutsch. Zeit. für Chir., 1885, xxii., 149.	Maas.	32	9	23	2	..
New York Med. Jour., 1880, xli., 421; Medical News, 1884, xliv., 409.	McBurney.	9	..	9	..	..
Edinburgh Med. Jour., 1879, xxv., 500.	Spence.	2	..	2	..	..
Med. Times and Gazette, 1881, ii., 573; Liverpool M. C. Jour., 1883, iii., 80.	Puzey.	5	..	5	..	..
New York Med. Jour., 1883, xxxvii., 325; Annals of Surgery, 1883, viii., 30.	Poor.	6	..	6	..	..
Lancet, 1881, ii., 705.	Ransford.	3	..	3	..	..
Hospitals-Tidende, 1884, 3 R., ii., 241.	Hansen.	3	..	3	..	..
Dublin Monthly Jour., 1882, 3ds., lxxiv. 326.	Stokes.	3	..	3	1	..
Dublin Monthly Jour., 1880, 3ds., lxx., 1.	Coppinger.	3	..	3	..	..
Wiener Med. Presse., 1879, xx., 742.	Albert.	3	..	3	..	..
Lancet, 1884, ii., 145.	Jalland.	6	1	5	1	..
Chicago Med. Jour., 1884, xlix., 289.	Fenger.	3	..	3	..	..
Lancet, 1881, ii., 910; 1885, i., 473.	Brock.	2	..	2	..	..
Med. Press and Circular, 1882, xxxiv., 505.	Norton.	2	..	2	..	..
Pester Med. Ch. Presse, 1882, xviii., 35; Chir. Klin. im K. Julius Hosp. zu Würzburg, 1879, 153.	Puky.	3	..	3	1	..
Report from books of Roosevelt Hospital to New York Medical Record, by Dr. Silver, House-surgeon.	Sands, H. B.	8	1	7	1	..
Report by letter to New York Medical Record, by Dr. Gerster.	Gerster, A. G.	10	1	9	2	..
British Medical Jour., 1881, i., 852; Medical Chronicle, 1885, ii., 275.	Wright, G. A.	17	2	15	4	..
From table in this paper by different operators.	....	36	1	34	4	..
Morris, "How We Treat Wounds To-day," p. 20.	Bruns.	20	..	..	..	..
Total..............................	....	329	31	297	19	9.42
Deducting 15 phthisis, 1 ether, 2 amyloid disease, 2 nephritis, 1 poisoned wound	....	..	21	..	..	.
Leaving as a result of operations, deaths.	....	..	10	..	..	3.03

* Per cent. of amputations following excision, 5.77.

TABLE III.—*Showing Cause of Death*

	Number.	Septicæmia.	Pneumonia.	Pyæmia.	Phthisis.	Ether.	Cause not stated.	Marasmus.	Amyloid kidney and liver.	Acute nephritis.	Poisoned wound, knee-joint.
Ashhurst, Jr.............	2	1	1	..	..	..	..	..	..	..	..
Fenwick................	1	..	..	1	..	..	..	..	..	..	..
Schede..................	4	..	..	..	4	..	.	..	..	..	..
Phelps	1	..	..	..	..	1	..	..	..	..	..
Rydygier................	1	..	..	..	..	..	1	..	..	..	..
Saxtorph....	7	..	1	..	3	..	..	2	1	..	..
Maas	9	2	..	..	6	..	..	..	1	1	..
Jalland..................	1	..	..	..	..	..	..	..	..	..	..
Sands....................	1	..	1	..	..	..	..	..	..	..	..
Gerster	1	..	..	..	..	..	..	.	..	..	1
G. A. Wright............	2	..	..	..	1	..	..	..	..	1	..
From Table No. 1...... ..	1	..	..	..	1	..	..	..	..	..	..
Total	31	3	3	1	15	1	1	2	2	2	1

Many cases of joint disease among the poor, which might by long treatment be cured, if the patients could spare time from their work, should be excised, because they are then restored soon to health; when, if the operation were not performed, amputation would quite likely be demanded in after-years, owing to frequent relapses.

I desire to acknowledge the invaluable assistance of Dr. Robert T. Morris, of New York, in furnishing to me the statistics of cases which he translated from foreign journals for publication in this paper.

16 vols [illegible]
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a27